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G-PhAsER

Enhancing Student Learning through Video-Based Exam Corrections (Pencasts) in Introductory Physics Courses

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Supplemental Information:

Introduction

- Reflection and metacognition have large educational benefits [Baird 2007]
- We want to encourage and induce higher levels of reflection in students
- Exam corrections are a relatively common assignment that instructors may utilize in a course
- We propose students record a video of them explaining their mistakes and the correct answer to a problem rather than traditional exam corrections on paper
- This forces students to plan out how to explain a problem as well as verbalize it to a camera, which may [source needed] induce a higher level of reflection

Methods

- Introductory Mechanics for Engineers
- Studio Physics Class
- 2 Sections of 72 students

Friday	Monday	Tuesday	Wednesday	Thursday
Students take exam	Graded exams returned			Video Corrections Due

- Students submit their videos via Google form including a short survey gauging student experiences with 4 qualitative response questions and 1 quantitative question using a Likert item
- Thematic analysis will be conducted on the qualitative data by the first 3 authors with reliability determined by the arithmetic average of Cohen's Kappa for interrater reliability
- Students receive credit on the exam or course as an incentive to complete the voluntary assignment

Survey & Coding Manual

Question 1: Please describe your experience of creating this video to explain the solution to this problem.
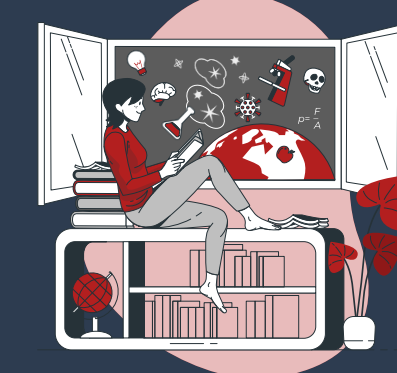
Video Creation
- "My phone kept running out of storage"
- "It took a long time to upload to YouTube"
- "It was super easy, I just screen-recorded my tablet"

Understanding
- "It took going back to see what I did wrong"
- "I feel like I understand it better now"

Credit
- "I'm just happy to get a higher score"
- "It was a great incentive to look back at the exam"

Fun
- "It was fun!"
- "I enjoyed the experience"
- "I hated every second of it"

Question 3: How did the process of explaining the mistakes in this video affect your understanding of this problem?

Understanding
- "I feel like I could solve a similar question on the next test"
- "I feel a lot better about this material"
- "I know where I went wrong now"

Verbalizing
- "It was like I was teaching the problem, which helped me understand it better"
- "Putting my thoughts into words made me realize what I did wrong"

Confidence
- "I feel a lot better about projectile problems now!"
- "It helped me realize I was just overthinking everything"

Unaffected
- "It didn't"
- "I already knew it, I just made a stupid mistake"

Question 2: Please describe any patterns or recurring mistakes you identified in your problem-solving, if any
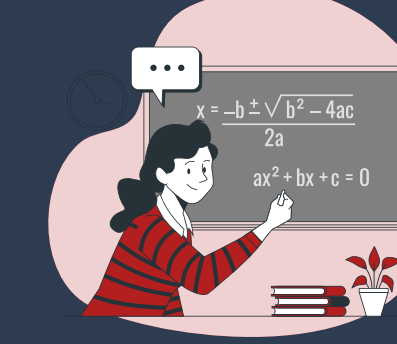
Graph
- "I mixed up position and velocity graphs"
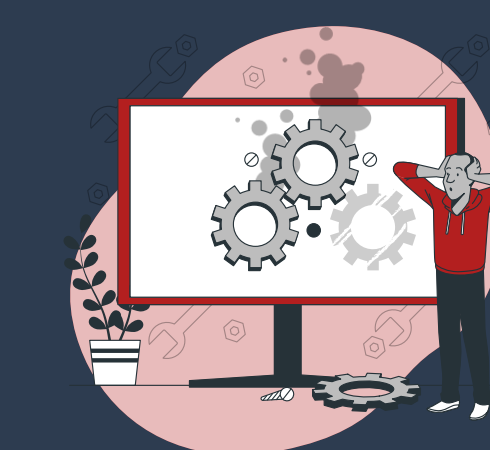- "I forgot to check what kind of graph it was"

Equation
- "I used the wrong equation"
- "I used the equation incorrectly"

Conceptual Error
- "I didn't account for the initial height of the projectile"
- "I didn't realize that time for A and time for B were different"

Simple Error
- "Stupid mistakes adding up"
- "I forgot delta y is negative"
- "Plugged into calculator wrong"
- "The problem said 379, I used 397"

Time Constraints
- "I ran out of time"
- "I was trying to go fast to have time for other problems"
- "I was going too fast and it led to stupid mistakes"

Psychological State
- "I got in my own head about it"
- "I just have bad test anxiety"
- "I got overwhelmed with all the info"
- "I was overthinking everything"

Question 4: On a scale of 1 to 5, with 1 being much less confident and 5 being much more confident, how confident do you feel about successfully completing another similar problem after creating the video?

Question 5: Would you consider using this method in the future to learn from your mistakes in exams or Homework assignments?
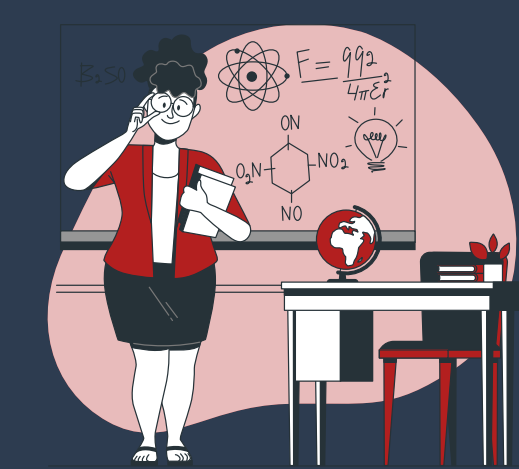
Discussion

- Coding manual is a living document and can/should be updated as data collection continues
- Limited training time for raters to learn the coding manual
- Easy to implement
- Adjustable to different contexts
- Students note their own reflective practices
- Student response has been overwhelmingly positive
- No data on broader impact of video corrections on course performance yet
- Unfortunately requires potentially infeasible grading times
- Requires grading videos, which may be slow
- May be used as an assignment rather than related to the exam

Future Work

- Analyze data using this coding manual
- Track student performance over several semesters to observe and compare to peers without this opportunity
- Implement different reflective practices instead of corrections, such as incorrect solutions
- Allow students the option between premade incorrect solutions to a new problem and their own flawed work from the exam